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REGIONAL COST ADJUSTMENTS FOR WASHINGTON STATE

Prepared for the

K-12 Advisory Committee

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Prepared By
Jennifer Imazeki, Ph.D.

Lawrence O. Picus and Associates

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Regional Cost Adjustments for Washington State

It is well-established that the purchasing power of a dollar is not the same in all places and this has implications for wages. To achieve a given standard of living in New York City or San Francisco costs more than in Albany or Sacramento. Because it takes different amounts of money to buy the same bundle of goods in different locations, equivalent workers will demand different wages for equivalent jobs. If wages are not sufficiently high to compensate workers for higher costs, then it will be harder to attract and retain workers in high-cost areas. What is often overlooked is that the experience of living in some places is also more pleasant than in others. Although the cost of living is higher, New York City and San Francisco also offer museums, access to businesses, better weather, etc., that are not available in Albany or Sacramento. Of course, these cities also have more crime, poverty and other urban problems that are less prevalent elsewhere. But if a location is attractive enough, positive amenities can provide some offsetting compensation for higher living costs so workers will not require wages that are quite as high as they would otherwise. Thus, the true difference in wages needed to attract and retain equivalent workers in a given location will depend on the mix of living costs and local amenities.

Under current Washington state policy, salaries for teachers of the same education and experience are the same across almost all Washington school districts. Unless one believes that the cost of living and locational amenities are also identical across all districts, this type of uniform wage policy is sure to lead to teacher shortages in some regions, with districts in higher-cost and/or less attractive locations generally likely to suffer higher attrition and greater difficulty in recruiting.

This report proposes a way to adjust teacher salaries for differential costs across regions in Washington State, using a comparable wage index (CWI). A comparable wage index uses the observed variation in wages of college-educated non-teachers across regions to assess the necessary variation in teacher salaries. For example, if wages for lawyers, nurses, engineers, accountants, etc. are all 10 percent higher in Seattle than the state average (assuming identical worker characteristics), then the CWI would suggest that wages for teachers should also be 10 percent higher in Seattle. That is, if other Seattle employers must pay 10 percent higher wages to attract and retain non-teachers, then Seattle school districts must as well. If they do not, then teaching will be less attractive, relative to other occupations, and Seattle districts will likely face bigger problems with teacher shortages than districts elsewhere.

The comparable wage index for Washington suggests a substantial amount of variation in wage costs within the state. Districts in the Richland-Kennewick-Pasco and Seattle-Bellevue-Everett MSAs are at a particular disadvantage. In some districts, particularly in the Yakima and Spokane MSAs, wage costs as a whole are relatively low but teachers with math and science skills may be substantially underpaid. It is also important to keep in mind that the CWI focuses on wage *differentials* across regions but even in the lowest-cost areas, teacher salary *levels* are considerably below levels in other occupations. This suggests that teacher salaries are below competitive levels across the state, although they are even less competitive in some areas relative to others.

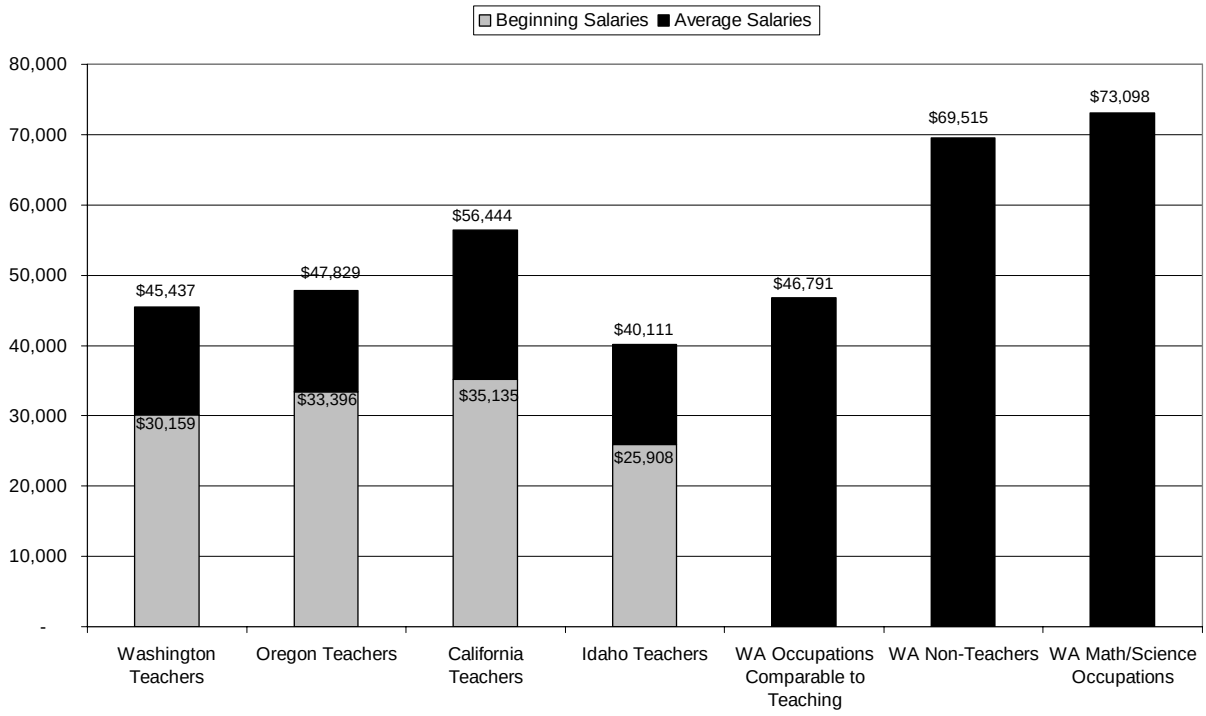
Regional Wage Variation

Before analyzing cost variation within the state, it is useful to see how statewide teacher salaries compare to other states, and to other occupations in the state. Figure 1 shows these comparisons, using beginning and average salaries for Washington teachers. The first comparison group is teachers in neighboring states, using data from the American Federation of Teachers' Salary Survey 2004. Washington teachers, both at entry and on average, earn slightly more than Idaho teachers, slight less than Oregon teachers, and substantially less than California teachers.

Within the state, the average salary for Washington teachers is only slightly lower than the average salary of workers in occupations that are similar to teachers in skills and job activities, a group that includes college professors and other types of teachers, social workers and counselors, and health care occupations such as nurses and physical therapists (for a full list of these teaching-comparable occupations, see Appendix A). However, teachers are substantially underpaid (roughly $24,000) relative to college-educated workers in all other skilled occupations.[1] This gap is even larger when the comparison group is restricted to workers in

[1] The "non-teacher" comparison group consists of occupations where the majority of workers have at least a bachelor's degree. For a full list of included occupations, see Appendix A.

Figure 1
Average Salaries, 2004-2005

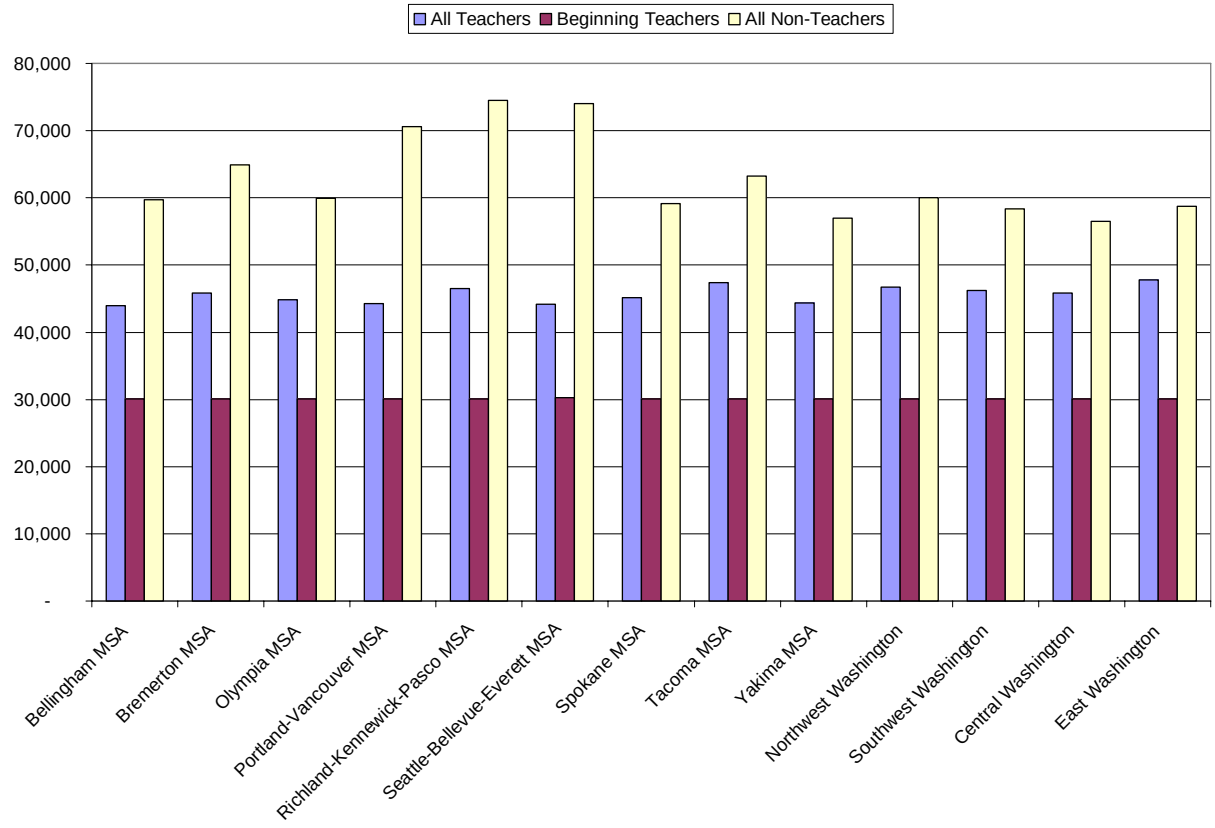


Sources: Washington average wages from Occupational Employment Statistics survey, 2005; teacher wages for all states from American Federation of Teachers Salary Survey 2004

occupations that require strong math- or science-related skills, such as engineers, computer programmers, and scientists (for a full list of these math/science occupations, see Appendix A).

Although average teacher salaries are substantially lower than average salaries for other college-educated workers across the state, the gap varies quite a bit within the state. Figure 2 shows average teacher salaries, beginning teacher salaries and average non-teacher salaries for thirteen Washington regions. The thirteen regions consist of the nine Metropolitan Statistical Areas, as defined by the federal Office of Management and Budget, and four other multi-county regions, defined by the Labor Market and Economic Analysis Division of the Washington State Employment Security Department (for a complete list of counties in each area, see Appendix A). As Figure 2 makes clear, there is very little variation across regions in average teacher salaries, with a difference of only $3,751 between the lowest- and highest-salary areas ($44,008 in the Bellingham MSA and $47,759 in the East Washington area, respectively). For beginning teacher salaries, there is almost no variation at all. This is not particularly surprising, given the statewide

Figure 2
Average Washington Salaries
By Region



salary schedule that constrains most districts to offer identical salaries for teachers with the same education and experience. However, non-teacher salaries vary widely across the state. At $74,528, average salaries in the highest-salary region, the Richland-Kennewick-Pasco MSA, are almost 26 percent higher than in the lowest-salary region, the Central Washington area. The gap between average salaries for teachers and non-teachers ranges from just under $11,000, or 23 percent, in the Central Washington area to almost $30,000, or 68 percent, in the Seattle-Bellevue-Everett MSA.

Adjusting for Regional Costs

Figure 2 makes it clear that there is a great deal of variation across regions in average salaries for non-teachers but very little variation in average or beginning salaries for teachers. This would suggest that districts in areas with large gaps will have a very difficult time attracting

and retaining teachers. One should also note that even when non-teacher salaries are lowest, they are still higher than teacher salaries. This suggests that on the whole, districts are likely to have a hard time competing for teachers, while the variation implies some districts will have a harder time than others.

Variation in *average* wages can be driven for a number of factors. One factor is the occupational mix. Some occupations must pay more to attract workers because they are considered dangerous or undesirable, or because they require highly specialized skills. Areas with proportionately large concentrations of these high-paying occupations will have higher average wages. Another factor is the education or experience profile of workers. All else equal, more educated and more experienced workers will earn higher wages than other workers. Regions of the state with proportionately more of these highly-educated, experienced workers will have higher average wages. Finally, average wages may differ because of locational characteristics. Workers may demand higher wages to live in areas with either few amenities or with a high cost of living. Regions of the state that are relatively unattractive to live in, or with high costs of living, will have higher average wages.

Of these factors, only the last represents *costs* that the state should consider in adjusting teacher wages. *Costs* imply differences in what districts need to pay to attract and retain high-quality teachers, and should reflect factors that are outside the control of the local district but relevant to teachers. It would be inappropriate to penalize a district with a low cost adjustment simply because it is in a region with a lot of low-wage jobs or where many of the region's workers are young and inexperienced. On the other hand, it seems appropriate to compensate districts that are challenged by an undesirable location or high cost of living.

It is important to keep in mind that location amenities and cost of living are two sides of the same coin. Often, discussions of regional cost adjustments focus only on cost of living, primarily housing costs. For example, the Washington Office of Financial Management's 2000 report, "A Review of K-12 Regional Cost Issues," centered almost entirely around housing costs. But cost of living indices tend to over-estimate the costs associated with living in very desirable areas that often have very high housing costs, and under-estimate the amount of money that districts need to pay to attract qualified teachers and other staff to less desirable areas of the state. To see why, consider the source of high housing costs: standard economic theory states that prices rise either when supply is low or demand is high. Although housing markets can be quite

complex, it is relatively safe to say that, all else equal, demand for housing will be higher in desirable locations, with many positive amenities. These amenities may be geographic, such as good weather or proximity to the ocean, or they could be social, such as a vibrant artistic community or good schools. However defined, areas with positive amenities will have higher housing costs because people want to live there, all else equal. But these same amenities also reduce the wage that an employer must pay to attract workers. As housing and labor markets adjust to people moving into and out of certain areas, workers "buy" amenities in part through higher housing prices and in part through lower wages. For example, median home prices in Seattle may be 15 percent higher than median house prices in Wenatchee but that does not mean Seattle employers need to pay workers 15 percent more if Seattle is also a more attractive place to live.

If the state wants to enable districts in all areas to compete equally for teachers of a given quality, the appropriate index is one that captures wage variation due to locational characteristics (both housing costs and amenities, or lack thereof) but that does not vary with specific job or worker characteristics. Such an index is known as a comparable wage index (CWI). Please see Appendix B for a full description of the data and methods used to estimate a CWI for Washington. One way to think about the CWI is that it reflects how wages vary across regions for college-educated workers with identical characteristics (i.e., same age, education, etc.) and assuming that every region has an identical mix of jobs.[2]

Table 1 shows the 2005 CWI for Washington. A value of 100 corresponds to the statewide employment-weighted average salary so values above 100 indicate higher-than-average costs while values below 100 indicate lower-than-average costs. For example, wage costs in the Tacoma MSA are 1.6 percent higher than average while wage costs in the Bellingham MSA are 9.4 percent lower than average (an index value of 90.6). Alternatively, one could say that costs are 11 percent higher in Tacoma than Bellingham. The highest-cost region is the Richland-Kennewick-Pasco MSA where costs are 21 percent higher than in the lowest-cost region, the Spokane MSA.

[2] Some amenities will necessarily be personal to an individual; for example, someone with strong family ties in Bellingham may be willing to take a job there at a lower wage than someone else. With the method used to estimate the CWI, these individual preferences should average out. The resulting index reflects wage costs for an average worker, with no idiosyncratic preferences.

Table 1
Comparable Wage Index, 2005

Region	CWI	Average Salaries, Unadjusted
Bellingham MSA	90.6	85.9
Bremerton MSA	100.8	93.3
Olympia MSA	93.2	86.2
Portland-Vancouver MSA	96.2	101.5
Richland-Kennewick-Pasco MSA	106.7	107.2
Seattle-Bellevue-Everett MSA	103.5	106.4
Spokane MSA	85.8	85.1
Tacoma MSA	101.6	91.0
Yakima MSA	96.0	81.9
Northwest Washington	89.5	86.4
Southwest Washington	86.7	83.9
Central Washington	88.1	81.3
East Washington	86.0	84.5
State Average Salary (CWI = 100)	$53,464	

For comparison, unadjusted average salaries (used to generate Figure 2) were also converted to an index format; that index is shown in the last column.[3] Compared to unadjusted average salaries, the comparable wage index shows somewhat less variation. In general, areas with CWI values that are noticeably lower than with unadjusted salaries (such as the Seattle-Bellevue-Everett MSA and the Portland-Vancouver MSA) likely have large concentrations of high-paying jobs or more experienced workers.

Note that the CWI focuses on cost differences between regions within the state. Because teacher salaries are fairly uniform across the state, teachers in higher-cost regions are at a relative disadvantage; that is, districts in high-cost regions are less competitive than districts in low-cost regions. However, remember that even in the lowest-cost regions, teacher salaries are substantially lower than non-teacher salaries. Thus, teacher salaries are not truly at competitive levels anywhere in Washington; the CWI simply points out that they are even less competitive in some regions than others.

[3] Specifically, average salaries in each region, taken from the 2005 Occupational Employment Statistics Survey, were divided by the statewide employment-weighted average ($69,515), and multiplied by 100. For example, average unadjusted salary in the Seattle MSA is $73,990, implying an index value of 106.5 = 73,990/69,515)*100.

Alternative Comparisons

The index presented in Table 1 is based on wages for college-educated workers in all non-teacher occupations. Note that because these wages control for job and worker characteristics, the variation left over is driven by differences in locational characteristics (amenities and cost of living). Specifically, it is driven by worker *preferences* for locational characteristics. As discussed earlier, wages are lower, and house prices are higher, in locations with nice amenities because people want to live there and are willing to take lower wages and/or pay more for houses. Thus, the CWI essentially captures the average preferences for location among all non-teacher workers. If teachers have similar preferences to other workers, they will require similar wage adjustments.

Although it is difficult to assess whether or not this is actually the case, one alternative is to restrict the comparison to occupations that are most comparable to teachers in terms of required skills and job duties. This would presumably capture individuals with preferences most similar to teachers and better reflect the true differences in wage costs across regions. For this analysis, the CWI was estimated using only workers in the subset of occupations that were deemed comparable to teachers; see Appendix A for a complete list of these occupations. The resulting CWI is shown in column 2 of Table 2. In comparison to the original CWI (shown again in column 1 of Table 2), the index for comparable occupations is much more compressed. Many of the below-average-cost regions show slightly higher costs while the three above-average-cost regions show slightly lower costs. The two regions with the largest differences between the two indices are Bremerton MSA, which jumps from a CWI value of 100.8 to 112.2, and Yakima MSA, which jumps from 96.0 to 103.7. Higher values of the index for comparable occupations, relative to the original CWI, indicates that workers in these comparable occupations do not value the amenities of the area as much as other workers.[4]

[4] Alternatively, in areas with relatively low cost of living and few amenities, one could think of it as workers in teaching-comparable occupations having a stronger *distaste* for disamenities. For example, in East Washington, wage costs based on all workers are 14 percent below average, probably due to low cost of living. For workers in teaching-comparable occupations, wage costs are only 6.1 percent below average, indicating that although the cost of living may be lower, these workers may have a stronger distaste for living in more rural, isolated communities.

Table 2
Comparable Wage Indices
Alternative Samples

Region	CWI - All	Comparable Occupations	Math/Science Occupations
Bellingham MSA	90.6	93.9	94.2
Bremerton MSA	100.8	112.2	105.5
Olympia MSA	93.2	95.4	90.7
Portland-Vancouver MSA	96.2	96.2	99.7
Richland-Kennewick-Pasco MSA	106.7	102.9	109.3
Seattle-Bellevue-Everett MSA	103.5	100.8	101.7
Spokane MSA	85.8	98.7	93.0
Tacoma MSA	101.6	100.9	102.8
Yakima MSA	96.0	103.7	112.3
Northwest Washington	89.5	94.8	89.0
Southwest Washington	86.7	93.6	83.7
Central Washington	88.1	91.8	88.5
East Washington	86.0	93.9	86.1
State Average Salary	$53,464	$42,067	$64,013

Hard-to-staff fields

The comparable wage index, whether estimated using all workers or workers in teaching-comparable occupations, reflects variation in wages for an average college-educated worker and thus attempts to capture the general labor market with which school districts compete for teachers. That is, individuals face the choice of teaching in a particular school district or taking a job in an alternative occupation; to the extent that school districts do not compensate teachers for location costs in the same way that other employers do, those districts will be at a competitive disadvantage. But not all teachers have the same alternative opportunities; in particular, teachers with training in particular fields, such as math and science, may have higher-paying choices available to them than teachers with more general training or lower-demand fields. When districts pay all teachers the same salary, regardless of subject specialty or special training, it can be particularly difficult to attract and retain teachers in higher-demand fields. And as with overall salaries, there is likely to be variation across regions in the premium associated with math or science skills, so that some districts are at more of a disadvantage than others.

A modified CWI, estimated using occupations that require math or science skills (and are therefore more likely alternatives for math and science teachers), better captures the variation in

salary costs for teachers in these specialties. This is shown in column 3 of Table 2. When comparing the index for all workers and the index for math/science occupations, a higher value of the latter implies that even if overall teacher salaries were adjusted for general differences in costs across regions, math and science teachers would still be at a relative disadvantage. For example, although the original CWI suggests that salary costs are 6.7 percent above the average in Richland-Kennewick-Pasco MSA, the math/science index implies salary costs that are 9.3 percent above the average. Thus, even if salaries were adjusted so that Richland teachers overall were given 6.7 percent more, Richland districts would likely still face challenges retaining math and science teachers. The larger the gap between the two indices, the less competitive districts are for teachers in these fields. The areas with the largest gaps between the math/science index and the original CWI are Spokane and Yakima MSAs. In both cases, the original CWI implies that these are relatively low-cost areas (costs that are 14.2 and 4 percent below average, respectively). But the higher values of the math/science index implies that even if salaries were adjusted for general cost differences, math and science teachers in these areas would be substantially underpaid relative to alternative occupations.

Regional Cost Adjustments for Washington State
Appendix A

Washington Regions and Counties

Region	Included counties:
Bellingham MSA	Whatcom
Bremerton MSA	Kitsap
Olympia MSA	Thurston
Portland-Vancouver MSA	Clark
Richland-Kennewick-Pasco MSA	Benton and Franklin
Seattle-Bellevue-Everett MSA	King, Snohomish, and Island
Spokane MSA	Spokane
Tacoma MSA	Pierce
Yakima MSA	Yakima
Northwest Washington	Clallam, Grays Harbor, Jefferson, Mason, Pacific, San Juan, and Skagit
Southwest Washington	Cowlitz, Klickitat, Lewis, Skamania, and Wahkiakum
Central Washington	Adams, Chelan, Douglas, Grant, Kittitas, and Okanogan
East Washington	Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Stevens, Walla Walla, and Whitman

Occupations Comparable to Teaching in Skills and Job Duties

OES Code	OES Title
253011	Adult Literacy, Remedial Education, and GED Teachers and Instructors
251061	Anthropology and Archeology Teachers, Postsecondary
251121	Art, Drama, and Music Teachers, Postsecondary
251051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary
291121	Audiologists
251042	Biological Science Teachers, Postsecondary
251011	Business Teachers, Postsecondary
251052	Chemistry Teachers, Postsecondary
211021	Child, Family, and School Social Workers
193031	Clinical, Counseling, and School Psychologists
251122	Communications Teachers, Postsecondary
172061	Computer Hardware Engineers
291031	Dietitians and Nutritionists
251063	Economics Teachers, Postsecondary
251081	Education Teachers, Postsecondary
211012	Educational, Vocational, and School Counselors
251032	Engineering Teachers, Postsecondary
251123	English Language and Literature Teachers, Postsecondary
251124	Foreign Language and Literature Teachers, Postsecondary
211091	Health Educators
251125	History Teachers, Postsecondary
251192	Home Economics Teachers, Postsecondary
259031	Instructional Coordinators
254021	Librarians
211013	Marriage and Family Therapists
251022	Mathematical Science Teachers, Postsecondary
211022	Medical and Public Health Social Workers
211023	Mental Health and Substance Abuse Social Workers
211014	Mental Health Counselors
251072	Nursing Instructors and Teachers, Postsecondary
291051	Pharmacists
251126	Philosophy and Religion Teachers, Postsecondary
291123	Physical Therapists
291071	Physician Assistants
251054	Physics Teachers, Postsecondary
251065	Political Science Teachers, Postsecondary
252011	Preschool Teachers, Except Special Education
251066	Psychology Teachers, Postsecondary
399032	Recreation Workers
211015	Rehabilitation Counselors
251067	Sociology Teachers, Postsecondary
252042	Special Education Teachers, Middle School
252041	Special Education Teachers, Preschool, Kindergarten, Elementary School
252043	Special Education Teachers, Secondary School
291127	Speech-Language Pathologists

131073 Training and Development Specialists
252023 Vocational Education Teachers, Middle School
252032 Vocational Education Teachers, Secondary School

Math/Science Occupations

OES Codes	OES Title
132011	Accountants and Auditors
172031	Biomedical Engineers
172041	Chemical Engineers
192031	Chemists
172051	Civil Engineers
151011	Computer and Information Scientists, Research
113021	Computer and Information Systems Managers
151021	Computer Programmers
251021	Computer Science Teachers, Postsecondary
151031	Computer Software Engineers, Applications
151032	Computer Software Engineers, Systems Software
151051	Computer Systems Analysts
191031	Conservation Scientists
172071	Electrical Engineers
172072	Electronics Engineers, Except Computer
119041	Engineering Managers
172199	Engineers, All Other
172081	Environmental Engineers
192041	Environmental Scientists and Specialists, Including Health
192042	Geoscientists, Except Hydrologists and Geographers
172111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
172112	Industrial Engineers
172121	Marine Engineers and Naval Architects
172131	Materials Engineers
192032	Materials Scientists
172141	Mechanical Engineers
292011	Medical and Clinical Laboratory Technologists
172151	Mining and Geological Engineers, Including Mining Safety Engineers
172161	Nuclear Engineers
192099	Physical Scientists, All Other
192012	Physicists
152041	Statisticians

Regional Cost Adjustments for Washington State
Appendix B

Creating the Comparable Wage Index

The Comparable Wage Index (CWI) captures variation in wages due to locational characteristics (both housing costs and amenities, or lack thereof) but not variation due to specific job or worker characteristics. Following Taylor (2005),[5] the CWI is created by estimating the following equation:

$$(1) \qquad LnAnnualSalary_i = \beta_W W_i + \beta_O O_i + \beta_I I_i + \beta_R R_i + \varepsilon_i$$

where W_i is a vector of characteristics of worker i, O_i is an indicator variable for worker i's occupation, I_i is an indicator variable for worker i's industry, R_i is an indicator variable for the region that worker i lives in, and ε_i is an idiosyncratic error term. Estimation of this model obviously requires data on individual worker characteristics as well industry, occupation, wages and location. The only dataset that fits these requirements is the 2000 Census Public Use Microdata 5 Percent Sample (PUMS). The vector of worker characteristics includes age, age-squared, education, gender, race, hours worked per week (in logs) and weeks worked per year (in logs). In order to restrict the sample to workers comparable to teachers, observations were dropped for those with less than a bachelor's degree, self-employed workers, those who work less than 20 hours per week or earn less than $5000 per year. The estimated coefficients are shown in Table 1B (in the interests of space, the coefficients for the location, occupation and industry fixed effects are not shown). As would be expected, wages increase with age, though at a decreasing rate, and with education. Whites and men also earn more than non-whites and women.

These coefficients are then used to predict a wage in each region for a worker with average characteristics (i.e., average values of all worker characteristics). The predicted wages from the Census regression are shown in column 1 of Table 2B. If desired, a CWI could be created by dividing each local predicted wage by this statewide average.

[5] Taylor, Lori, "Comparable Wages, Inflation and School Finance Equity," Bush School Working Paper #540, March 2005.

Table 1B
Wage Regression Results
2000 Census, PUMS

Variable	Coefficient	t-statistic
Log of weekly hours	0.84	44.18
Log of weeks worked last year	0.53	16.28
Age	0.08	31.27
Age-squared	0.00	-26.09
Gender (male=1)	0.15	19.29
Race (white=1)	0.06	5.91
Masters degree	0.05	5.16
Professional degree	0.06	2.76
Ph.D.	0.16	7.02

All estimates statistically significant at the 5% level
Fixed effects for 421 occupations, 250 industries and 10 regions not shown

The Census data is the only available dataset that includes both locational information and characteristics of individual workers. However, one important drawback of these data is that they are only updated once a decade. Thus, any index generated from the coefficients shown in Table 1B reflects the variation that existed at the time of the 2000 Census, but if regional wages grow at different rates over time, this index will be less useful as the years go by. Fortunately, data from the Occupational Employment Statistics (OES) survey can be used to update the baseline Census-based CWI. The OES data is collected annually by the Bureau of Labor Statistics and provides average wages by occupation and region. It does not include any information about worker characteristics and therefore is not appropriate for constructing the baseline index.[6] But if the distribution of demographic characteristics within occupations is relatively stable over time, then we can use changes in the OES-based index to adjust the Census-based baseline index. For example, if the OES data suggests that wages in the Seattle region grew by 10 percent between 2000 and 2005, then the predicted wage for Seattle from the Census estimation should be adjusted upward by 10 percent.

The one adjustment for worker characteristics that can be made to the OES data is to restrict the sample to occupations where entry-level positions generally require at least a

[6] In terms of equation (1), the OES data does not allow the inclusion of W. Equation (1) can only be estimated as the occupational average wage regressed on occupational and regional dummy variables.

Table 2B
Predicted Wages and Growth Rates

Region	Predicted Wage, 2000	Growth Rate	Predicted Wage, 2005
Bellingham MSA	37,484	1.29	48,439
Bremerton MSA	39,116	1.38	53,893
Olympia MSA	39,863	1.25	49,851
Portland-Vancouver MSA	41,841	1.23	51,445
Richland-Kennewick-Pasco MSA	43,336	1.32	57,060
Seattle-Bellevue-Everett MSA	43,697	1.27	55,333
Spokane MSA	37,229	1.23	45,857
Tacoma MSA	40,957	1.33	54,307
Yakima MSA	40,300	1.27	51,310
Northwest Washington	40,300	1.27	51,034
Southwest Washington	40,300	1.23	49,484
Central Washington	40,300	1.25	50,277
East Washington	40,300	1.22	49,071
Statewide Average			53,464

bachelor's degree. The Labor Market and Economic Analysis Division of the Washington State Employment Security Department attaches education codes to each occupation in the OES that reflect the training required for entry-level positions. Occupations with education codes 1 (professional degree) through 5 (bachelor's degree) were retained and indicators for these advanced degrees were also included in the regression, along with indicators for occupation and region. It appears that growth was particularly high in Bremerton, contributing to that region having below-average wage costs in 2000 but slightly above-average wage costs in 2005.

The OES models were estimated using data from 1999 (corresponding to the year that the 2000 Census data were collected) and 2005. Each observation represents one occupation-location combination and the regression is weighted by total employment in that occupation-location.[7] For each region, a growth rate is calculated as the 2005 predicted wage for that region divided by the 1999 predicted wage for that region. This growth rate is then applied to the predicted wage from the Census regression. These growth rates are shown in Column 2 of Table 2B. The statewide average is calculated as the employment-weighted average of all regional

[7] In this case, each observation represents an average, rather than individual workers, and averages calculated over larger populations will be calculated more precisely. To account for these differences in precision, it is standard to weight by the number of workers used to generate the average.

wages, and the 2005 CWI is created by dividing each updated local wage by this statewide average.

There is one important difference between the 1999 and 2005 OES data. In 1999, the Labor Market and Economic Analysis Division reported wage averages for the 9 MSAs but grouped the rest of the state together into one region. It was not until 2002 that the rest of the state was divided into four regions (Northwest, Southwest, Central and East). Therefore, the 1999 OES model is estimated with only ten regions. In order to be consistent with this, the baseline Census model was also estimated with the same ten regions; hence, Northwest, Southwest, Central and East Washington all have the same predicted wage for 2000. However, the growth rates for these four areas are based on different predicted wages for 2005, resulting in separate index values for the 2005 CWI.

Alternative Samples

Indices based on teaching-comparable occupations and math/science occupations are generated by the same process except that the original Census PUMS sample is restricted to individuals in those occupations; i.e., equation (1) is estimated using samples that include only the specified occupations. The growth rates are also calculated with models estimated with OES data restricted to the selected occupations. Tables 3B and 4B show the predicted wages and growth rates for those samples.

Table 3B
Predicted Wages and Growth Rates
Teaching-Comparable Occupations

Region	Predicted Wage, 2000	Growth Rate	Predicted Wage, 2005
Bellingham MSA	33,356	1.18	39,503
Bremerton MSA	35,892	1.32	47,214
Olympia MSA	33,895	1.18	40,117
Portland-Vancouver MSA	33,326	1.21	40,461
Richland-Kennewick-Pasco MSA	33,616	1.29	43,306
Seattle-Bellevue-Everett MSA	35,349	1.20	42,394
Spokane MSA	33,086	1.25	41,523
Tacoma MSA	34,088	1.24	42,437
Yakima MSA	35,669	1.22	43,603
Northwest Washington	35,669	1.24	44,402
Southwest Washington	35,669	1.23	43,837
Central Washington	35,669	1.21	43,010
East Washington	35,669	1.23	43,989
Statewide Average			42,067

Table 4B
Predicted Wages and Growth Rates
Math/Science Occupations

Region	Predicted Wage, 2000	Growth Rate	Predicted Wage, 2005
Bellingham MSA	51,524	1.17	60,288
Bremerton MSA	49,758	1.36	67,526
Olympia MSA	45,695	1.27	58,060
Portland-Vancouver MSA	51,262	1.24	63,817
Richland-Kennewick-Pasco MSA	55,724	1.26	69,964
Seattle-Bellevue-Everett MSA	51,959	1.25	65,098
Spokane MSA	47,225	1.26	59,519
Tacoma MSA	48,936	1.34	65,812
Yakima MSA	49,336	1.46	71,879
Northwest Washington	49,336	1.42	70,165
Southwest Washington	49,336	1.34	65,965
Central Washington	49,336	1.41	69,757
East Washington	49,336	1.38	67,867
Statewide Average			64,013